

WHAT IS CLAIMED IS:

1. An ink jet printing apparatus to form an image on a print medium by ejecting ink onto the print  
5 medium from a plurality of nozzles arrayed in a print head, the printing apparatus comprising:

a recovery means to recover a normal ink ejection state of each nozzle in the print head; and

10 recovery operation determining means for dividing the nozzles into a plurality of blocks, counting the number of ejections from the nozzles in each block and, based on the accumulated number of ejections for each block, determining whether or not to execute a recovery operation of said recovery means.

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2. An ink jet printing apparatus as claimed in claim 1, wherein said recovery operation determining means determines to execute the recovery operation on the print head when at least one of the accumulated 20 numbers of ejections for the individual blocks reaches a predetermined threshold.

25 3. An ink jet printing apparatus as claimed in claim 2, wherein the predetermined threshold is a value that differs from one block to another.

4. An ink jet printing apparatus as claimed in

claim 2, further comprising:

an accumulated ejection number correction means to correct by a weighting value the accumulated number of ejections counted for each block;

5 wherein said recovery operation determining means compares the accumulated numbers of ejections corrected by said accumulated ejection number correction means with the predetermined threshold.

10 5. An ink jet printing apparatus as claimed in claim 4, wherein said accumulated ejection number correction means increases the weighting value as the position of the associated nozzle block is farther away from an ink supply port of the print head and 15 multiplies the accumulated number of ejections by the associated weighting value to correct the accumulated number of ejections.

6. An ink jet printing apparatus as claimed in 20 claim 4, wherein the weighting value is changed according to a temperature in the ink jet printing apparatus.

7. An ink jet printing apparatus as claimed in 25 claim 6, wherein the weighting value is increased as the temperature in the ink jet printing apparatus rises.

8. An ink jet printing apparatus as claimed in claim 1, wherein the recovery operation includes an operation of moving ink in the print head.

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9. An ink jet printing apparatus as claimed in claim 8, wherein the recovery operation includes a preliminary ejection for ejecting ink not involved in a printing operation from each nozzle.

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10. An ink jet printing apparatus comprising:  
a print head control means to control a print head having a plurality of nozzles for ejecting ink according to print data;

15 a print head recovery means to recover a normal ink ejection state of each nozzle in the print head;

recovery operation determining means for deciding whether or not to execute a recovery operation of said print head recovery means; and

20 an accumulated print dot number counter to divide the nozzles of the print head into a plurality of blocks and count the accumulated number of print dots transferred to each block;

25 wherein said recovery operation determining means determines, based on a value of the accumulated print dot number counter, whether or not to execute the recovery operation of said print head recovery means.

11. An ink jet printing apparatus as claimed in  
claim 10, further comprising:

5 a weighting means to apply different weights to the  
values of said accumulated print dot number counters  
of the different blocks;

wherein said recovery operation determining means  
determines, based on a result of the weighting,  
whether or not to execute the recovery operation.

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12. An ink jet printing apparatus as claimed in  
claim 10, wherein the weight applied by said weighting  
means is based on a structure of a liquid chamber in  
the print head.

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13. An ink jet printing apparatus to form an image  
on a print medium by using a print head, wherein the  
print head includes a plurality of nozzles for  
ejecting ink, an ink supply port to receive a supply  
20 of ink, a liquid chamber to deliver the supplied ink  
to the nozzles, and a plurality of nozzle heaters  
provided one in each nozzle to heat the ink and  
thereby form a bubble in ink in each nozzle to eject  
the ink by a pressure of the expanding bubble, the  
25 printing apparatus comprising:

a print head recovery means to recover a normal ink  
ejection state of each nozzle in the print head;

recovery operation determining means for  
determining whether or not to execute a recovery  
operation of the print head recovery means; and  
an accumulated print dot number counter to divide  
5 the nozzles of the print head into a plurality of  
blocks and count the accumulated number of print dots  
transferred to each block;

wherein said recovery operation determining means  
determines, based on a value of the accumulated print  
10 dot number counter, whether or not to execute the  
recovery operation.

14. An ink jet printing apparatus as claimed in  
claim 13, wherein a target accumulated print dot  
15 number, on which is based a decision to execute the  
recovery operation, is set large for blocks near the  
ink supply port.

15. An ink jet printing apparatus as claimed in  
20 claim 1, wherein a direction in which the ink is  
ejected from the nozzles is almost vertical.

16. An ink jet printing apparatus as claimed in  
claim 1, having a plurality of the print heads.

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17. An ink jet printing apparatus comprising:  
a print head recovery means to recover a normal ink

ejection state of each nozzle in the print head;  
a memory means to store the accumulated number of  
print dots printed by each of the nozzles; and  
recovery operation determining means for setting  
5 different target print dot numbers to different  
nozzles and checking if the accumulated number of  
print dots printed by each of the nozzles has reached  
the corresponding target print dot number, in order to  
determine whether or not to execute the recovery  
10 operation of the print head recovery means.

18. An ink jet printing apparatus as claimed in  
claim 17, wherein the target print dot number, on  
which is based a decision to execute the recovery  
15 operation, is set large for nozzles near the ink  
supply port.

19. An ink jet printing apparatus as claimed in  
claim 17, wherein, when the target print dot number,  
20 on which is based a determination to execute the  
recovery operation, is set large for a central portion  
of the print head and small for end portions of the  
print head.

25 20. A print head recovery method for recovering a  
normal ink ejection state of each of nozzles in the  
print head used in an ink jet printing apparatus,

wherein the ink jet printing apparatus forms an image on a print medium by ejecting ink onto the print medium from a plurality of nozzles arrayed in the print head, the print head recovery method comprising:

5        a recovery operation determining step which divides the nozzles into a plurality of blocks, counts the number of ejections from those nozzles making up each block and, when at least one of the accumulated ejection numbers counted for the individual blocks  
10      reaches a predetermined threshold, decides to execute the recovery operation.

21. A printing apparatus to form an image on a print medium by ejecting ink onto the print medium from a plurality of nozzles arrayed in a print head, the printing apparatus comprising:

      a print head recovery means to recover a normal ink ejection state of the print head having the plurality of nozzles for ink ejection; and

20      recovery operation determining means for determining whether or not to execute a recovery operation of the print head recovery means, based on the accumulated number of ejections from predetermined nozzles in the print head.

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22. A printing apparatus as claimed in claim 21, further comprising:

means for executing the recovery operation of the print head recovery means when the accumulated number of ejections reaches a predetermined value.

5 23. A printing apparatus as claimed in claim 21, further comprising:

means for executing the recovery operation when the accumulated number of ejections from one of the predetermined nozzles reaches a predetermined value.

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24. A printing apparatus as claimed in claims 21 to 23, wherein the predetermined value differs from one of the predetermined nozzles to another.